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DATE: Thursday, September 16, 2004

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		DB=USPT,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR	
☐	L6	((rf near2 frequenc$3) near2 shift$3) same diversit$3	1
☐	L5	L4 and l2	48
☐	L4	(rf or (radio adj frequenc$)) same (frequenc$3 near2 shift$3)	3351
☐	L3	L2 and l1	26
☐	L2	375/267.ccls. or 375/347.ccls. or 455/132.ccls. or 455/137.ccls. or 455/138.ccls. or 375/130.ccls. or 375/144.ccls.	2498
☐	L1	(diversit$3) same (frequenc$3 near2 shift$3)	172

END OF SEARCH HISTORY

L3: Entry 5 of 26 File: USPT Jan 12, 1999

DOCUMENT-IDENTIFIER: US 5859842 A
TITLE: Antenna diversity techniques

Abstract Text (1):
A receiver system for antenna diversity employing a single backhaul cable. A single backhaul cable couples a receiver to a plurality of antennas. The signals from the antennas are combined onto the single backhaul cable using frequency offsets, spread spectrum code division, time division, or a combination thereof. At the receiver, the signals from the antennas are decoupled. In the case of frequency offsets, the antenna signals are decoupled by splitting the backhaul signal into a plurality of duplicate signals, frequency shifting selected ones of the duplicate signals, and correlating said frequency shifted signals. In the case of spread spectrum code division, the antenna signals are decoupled by splitting the backhaul signal into a plurality of duplicate signals and demultiplexing each of the duplicate signals with a different spread spectrum code. One or more antennas may be selected for communication in response decoupling the antenna signals.

Brief Summary Text (11):
The invention provides in one aspect a technique for antenna diversity minimizing the number of backhaul cables needed for a plurality of antennas. In one embodiment, a single cable couples the receiver to a plurality of antennas, and the signals from the antennas are combined onto the single cable. The technique for combining onto a single backhaul cable may employ frequency offsets, spread spectrum code division multiplexing, and/or time division multiplexing. At the receiver, the signals from the antennas are decoupled or otherwise separated. In the case of frequency offsets, the antenna signals are decoupled by splitting the backhaul signal into a plurality of duplicate signals, frequency shifting selected ones of the duplicate signals, and correlating said frequency shifted signals. In the case of spread spectrum code division, the antenna signals are decoupled by splitting the backhaul signal into a plurality of duplicate signals and demultiplexing each of the duplicate signals with a different spread spectrum code. One or more antennas may be selected for communication in response decoupling the antenna signals.

Current US Cross Reference Classification (2):
375/144

L1: Entry 5 of 45 File: USPT Sep 10, 2002

DOCUMENT-IDENTIFIER: US 6449469 B1
TITLE: Switched directional antenna for automotive radio receivers

Brief Summary Text (8):
In one aspect of the invention, a radio receiver system is installed on a vehicle, wherein the vehicle has front, back, left and right sides. A plurality of antenna elements are mounted on the vehicle, each antenna element producing a respective radio-frequency signal. An antenna combiner is coupled to the antenna elements electronically combining the radio-frequency signals according to a selected one of four predetermined phase/amplitude combinations to generate a combined antenna signal. The four predetermined phase/amplitude combinations each provides a respective directivity pattern substantially aligned with the front, back, left, and right sides of the vehicle, respectively. A tuner generates a tuner signal in response to the combined antenna signal. A quality detector generates a detection signal in response to a comparison of a quality of the tuner signal with a predetermined quality. A pattern selector is coupled to the quality detector in the antenna combiner to change-over the antenna combiner to a different one of the predetermined phase/amplitude combinations in response to the detection signal.

CLAIMS:

1. A radio receiver system installed on a vehicle, said vehicle having front, back, left, and right sides, said radio receiver system comprising: a plurality of antenna elements mounted on said vehicle, each antenna element producing a respective radio-frequency signal; an antenna combiner coupled to said antenna elements electronically combining said radio-frequency signals according to a selected one of four predetermined phase/amplitude combinations to generate a combined antenna signal, wherein said four predetermined phase/amplitude combinations each provides a respective directivity pattern substantially aligned with said front, back, left, and right sides, respectively, whereby said front and back directivity patterns are aligned with a street upon which said vehicle travels; a tuner generating a tuner signal in response to said combined antenna signal; a quality detector generating a detection signal in response to a comparison of a quality of said tuner signal and a predetermined quality; and a pattern selector coupled to said quality detector and said antenna combiner to change-over said antenna combiner to a different one of said predetermined phase/amplitude combinations in response to said detection signal.

L1: Entry 7 of 45 File: USPT Jun 4, 2002

DOCUMENT-IDENTIFIER: US 6400318 B1
TITLE: Adaptive array antenna

Brief Summary Text (22):
According to a third aspect of the present invention, an adaptive array antenna comprises: a plurality of antenna elements; a plurality of high-frequency circuits, each of which is connected to a corresponding one of said antenna elements; a high-frequency combining circuit for combining the outputs of said plurality of high-frequency circuits; at least one first RSSI circuit for monitoring at least one signal level of RF or IF signals from a plurality of individual antenna elements; a second RSSI circuit for monitoring the signal level of the combined RF or IF signal from said high-frequency combining circuit; (N-1) first variable gain circuits for allowing the variation in relative levels of all of RF or IF signals of each of individual elements; a second variable gain circuit capable of varying the signal level of the RF or IF signal from high-frequency combining circuit; and a gain control circuit for controlling the output signal level after combining to be within a predetermined range on the basis of RSSI signals from said first RSSI circuit and second RSSI circuit, and for controlling said first variable gain circuit and said second variable gain circuit so as to prevent a high-frequency circuit element for each of said individual elements from being saturated. In the above sentence, the term RSSI is an abbreviation of a received signal strength indication, which is a numerical value of the strength of en electric wave signal during receiving.

L1: Entry 11 of 45 File: USPT Jan 9, 2001

DOCUMENT-IDENTIFIER: US 6172970 B1
TITLE: Low-complexity antenna diversity receiver

Brief Summary Text (14):
Secondly, the only additional RF frontend components required are low-cost passive components for combining RF signals received through a plurality of antenna branches at the RF front-end.

Detailed Description Text (4):
The multi-diversity receiver shown in FIG. 1 comprises two antennas, Ant.1 & Ant.2, each followed by a low-noise RF amplifier (LNA). Conventional antennas meeting the spatial or polarization diversity requirements (un-correlated in a multipath environment) and conventional low-noise RF amplifiers meeting pre-determined performance criteria or technical specifications would be suitable for used. The amplified signals, after appropriate amplitude adjustment and phase shifting, for example by a pair of controllable variable signal attenuators and a phase-shifter, is combined into a single signal stream by an RF-combiner. The signal stream thus combined is then processed by a front-end RF circuit which down-converts the RF-signal so that it can be processed by a demodulator and further operated on by a baseband processor which would in turn control the amplitude attenuators and the phase shifter.

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L1: Entry 13 of 45 File: USPT Apr 18, 2000

DOCUMENT-IDENTIFIER: US 6052605 A
TITLE: Continuous interference assessment and avoidance in a land mobile radio system

Detailed Description Text (14):
Referring again to FIG. 1, the system 100 also comprises a transmit modular interconnect matrix 900 used to interconnect a plurality of radio channel units 203 with a plurality of antennas 202 for the transmission of signals provided by the radio channel units 203 via the antennas 202. Referring also to FIG. 3, the transmit modular interconnect matrix 900 is similar to the receive modular interconnect matrix 200 except that it includes a transmit switch 917 interconnected to a transmit terminal of each radio channel unit 203 (instead of a radio switch). Additionally, the signal splitter modules 205 (FIG. 2) are replaced with combiner modules 905 which combine RF signals provided by the various radio channel units into a combined RF signal which is provided from each combiner module 905 via an amplifier 910 and filter 908 to an antenna 202 for transmission. For purposes of controlling the transmit modular interconnect matrix 900, it is assumed that the antenna 202 indicated as having the strongest received signal strength at the operating frequency of the radio channel unit 203 is the best antenna for transmission of signals provided by the radio channel unit 203, and therefore, a control group switch and corresponding scanning receiver, phase locked loop, and micro-controller are not required in the transmit modular interconnect matrix 900. Instead, each transmit switch of the transmit modular interconnect matrix 900 is controlled to interconnect the transmit terminal of the radio channel unit with the antenna having the strongest signal strength at the operating frequency of the corresponding radio channel unit. Additionally, since the control group switches are not required in the a transmit modular interconnect matrix 900, the combiner modules 905 may be configured for connection with dummy loads 915 mounted to the combiner connectors which are not used. Alternatively, each combiner module 905 may be provided with only enough connectors for interconnection with the transmit switches.

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L1: Entry 16 of 45 File: USPT Dec 21, 1999

DOCUMENT-IDENTIFIER: US 6006113 A
TITLE: Radio signal scanning and targeting system for use in land mobile radio base sites

Detailed Description Text (33):
Referring again to FIG. 1, the system 100 also comprises a transmit modular interconnect matrix 900 used to interconnect a plurality of radio channel units 203 with a plurality of antennas 202 for the transmission of signals provided by the radio channel units 203 via the antennas 202. Referring also to FIG. 10, the transmit modular interconnect matrix 900 is similar to the receive modular interconnect matrix 200 except that the first switching module 917 is provided with one first connector for interconnection to a transmit terminal of a radio channel unit 203. Additionally, the signal splitter modules 205 (FIGS. 2A and 2B) are replaced with combiner modules 905 which combine RF signals provided to its plurality of second connectors into a combined RF signal which is provided from the first connector via an amplifier 910 and filter 908 to an antenna 202 for transmission. For purposes of controlling the transmit modular interconnect matrix 900, it is assumed that the antenna 202 indicated as having the strongest received signal strength at the operating frequency of the radio channel unit 203 is the best antenna for transmission of signals provided by the radio channel unit 203, and therefore, a second switching module and corresponding scanning receiver, phase locked loop, and micro-controller are not required in the transmit modular interconnect matrix 900. Instead, each first switching module of the transmit modular interconnect matrix 900 is controlled to interconnect its first connector with its second connector corresponding with the antenna having the strongest signal strength at the operating frequency of the corresponding radio channel unit. Additionally, since the five second switching modules are not required in the transmit modular interconnect matrix 900, the combiner modules 905 may be configured for connection with five dummy loads 915 mounted to the five second connectors which are not used. Alternatively, each combiner module 905 may be provided with only 15 second connectors for interconnection with the 15 first switching modules.

L7: Entry 14 of 14 File: DWPI Apr 29, 1993

DERWENT-ACC-NO: 1993-152773
DERWENT-WEEK: 200239

TITLE: Method for coding and decoding modulated radio frequency signal - mixes signal with unmodulated radio frequency signal subjected to frequency shifts following selected patterns for transmissions

Equivalent Abstract Text (1):
A method for coding and decoding a radio frequency signal, modulated with a TV program or other message and transmitted from a transmitting center to a plurality of receiver locations, wherein coding is effected by shifting, at short intervals, the frequency of each frequency component, contained in the radio frequency signal transmitted from the transmitting center, and decoding is effected by co-ordinately shifting, at authorized receiver locations, the frequency of each frequency component, contained in the radio frequency signal received at said locations, characterized in that the frequency shifts in the transmitted signal are obtained by subjecting a first uncoded radio frequency signal, modulated with the message in question, to mixing with a first unmodulated radio frequency signal, the frequency of which is shifted in accordance with a selected first pattern, and to subsequent filtering in order to form a coded radio frequency signal, modulated with said message, and in that the received radio frequency signal is frequency shifted by being subjected to mixing with a second unmodulated radio frequency signal, the frequency of which is shifted according to a second pattern corresponding to said first pattern, and to subsequent filtering in order to form a second uncoded radio frequency signal, modulated with said message and corresponding to said first uncoded radio frequency signal.

L6: Entry 1 of 13 File: USPT Jan 13, 2004

DOCUMENT-IDENTIFIER: US 6678512 B1
TITLE: Receiver system using analog to digital conversion at radio frequency and method

Detailed Description Text (4):
A combining arrangement 22 combines the RF analog signals on the channel branches 16a-x in desired fashion. The resulting composite analog signal is provided with analog signals in different frequency bands to an analog to digital converter 24 which digitizes the RF analog signals and provides the digitized signals to digital processing circuitry 26. Alternatively, depending on the embodiment, if the receiver 10 has a single branch 16, the combining arrangement 22 is simply a connection from the antenna 12 through the filter 20 (if required) to the A/D converter 24.

Current US Cross Reference Classification (2):
375/147

Other Reference Publication (2):
"CLC5526, CLC5956, and CLC5902 Diversity Receiver Chipset", National Semiconductor Corporation, Rev. 1.4, pp. 1-4 (Oct. 30, 1998).

L6: Entry 6 of 13 File: USPT Oct 12, 1999

DOCUMENT-IDENTIFIER: US 5966371 A
TITLE: Method and system for reducing interbeam interference and multipath fading in bent-pipe satellite communications systems

Abstract Text (1):
A method and system of forming and processing communication links in a satellite communications system. The satellite communications system includes a plurality of groups of transmitters, a satellite and a plurality of destination receivers. Each transmitter is associated with only one transmitter group and transmits a communications signal. Each respective communications signal is a CDMA signal having a predetermined code that is associated with a transmitter. Each respective predetermined code is selected from a code set assigned to the group of transmitters with which the transmitter is grouped. Each code set is different from code sets associated with the transmitters of other selected transmitter groups so that the code sets are arranged in a code set pattern that is repeated for selected groups of transmitters. The satellite receives the communications signals and groups together each received communications signal having a same predetermined code set. The code sets of selected uplink communications signals in a group of received communications signals are fully or partially despread, filtered, and respread so that the group of communications signals contains communications signals from only one code set. Each group of communications signals is then transmitted to a different destination receiver, or groups on different code sets to the same destination receiver.

Brief Summary Text (6):
FIG. 1 shows an exemplary multi-beam bent-pipe satellite communications system 10 that illustrates multipath fading caused by an uplink beam signal being coupled into two adjacent uplink beams and second tier interference. Satellite communications system 10 uses four spread-spectrum code sets, based, for example, on synchronous Walsh codes, for separating uplink beams 12, 13, 17 and 18 in a well-known manner, each of which accept transmitted signals using uplink frequency F1. The exemplary code sets are referred to herein as W1-W4. A ground station 11 transmits an uplink communications signal using uplink beam 12. While only ground station 11 is shown within the geographic region covered by beam 12, there are a plurality of ground stations within the geographic region covered by beam 12, but are not shown. Ground station 11 is geographically located near the edge of beam 12 such that the transmitted signal is also coupled into adjacent uplink beam 13. Beams 12 and 13 are received by satellite 14, combined with each other (and beams 17 and 18), and transmitted over a downlink beam 15 to a common earth station receiver 16, such as a terrestrial gateway. System 10 includes a plurality of gateway receiver stations, of which only gateway receiver 16 is shown. Multipath fading occurs at gateway receiver 16 because multiple versions of the signal from ground station 11 are received (effectively) from two different paths and are potentially destructively combined prior to being received by gateway receiver 16. Other beams, for instance, beam 19, which utilizes the same code set as beam 12 (and potentially the same code as ground station 11), couple into the beams adjacent to beam 12, such as beams 13 and 18, causing second tier interference when combined by the satellite and received by gateway receiver 16.

Brief Summary Text (11):
The present invention provides a method and a system that eliminates multipath fading and interference effects caused by an uplink transmission that is coupled into adjacent uplink beams, combined with a copy of itself or with signals from other beams using the same code sets, and downlink-routed to the same terrestrial gateway receiver. The advantages of the present invention are provided by a method and system for processing communication links in a satellite communications system. The satellite communications system includes a plurality of transmitter groups (TGs), a satellite and a plurality of destination receivers. Transmitter groups are determined according to which satellite uplink communications beam is assigned. All members of a TG are assigned to the same beam. Each TG is assigned a different beam and corresponding uplink resources. Each transmitter transmits a communications signal and is associated with only one transmitter group. Each respective communications signal is a code division multiple access (CDMA) signal selected from a predetermined code set that is associated with the transmitters of the transmitter group. Each respective code set is different from other code sets associated with the transmitters of selected transmitter groups so that they form a reuse pattern that is repeated for each beam group. The satellite receives the communications signals and groups together all received communications signals having a same predetermined code set on to a beam. The code sets of selected uplink communications signals in a group of received communications signals are translated to other code sets (including the possibility of being translated back to its own code set) and combined with signals from other beams so that the group of communications signals contains communications signals each having different codes. In the translation process, each signal is filtered for eliminating undesired multipath and interference from other beams. Bulk translation and filtering may be performed to simplify processing on board the satellite. The satellite then transmits each group of communications signals to a different destination receiver.

Detailed Description Text (6):
Alternatively, the down-conversion and filtering process performed by mixers 1003a-1003d and BPFs 1004a-1004b, indicated by 1012, can be omitted so that the bulk despreading and respreading occurs at RF frequencies. Accordingly, the center frequency of bandpass filters 1006a-1006d is the center frequency of each respective uplink transmission signal, IF combiner 1008 is replaced by an standard 4:1 RF combiner and local oscillator LO2 converts the RF signal output from the RF combiner to an appropriate downlink frequency in a well-known manner.

Detailed Description Text (9):
When the down-conversion and filtering process indicated by 1012 in FIG. 10 is not used, the sub-despreading and sub-respreading functions shown in FIG. 11 occurs at RF frequencies and, consequently, IF combiner is replaced by a standard n:1 RF combiner.

Current US Cross Reference Classification (1):
370/335

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		DB=USPT,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR	
☐	L7	((frequenc$3 near2 shift$3) near3 (rf or (radio near frequenc$3))) same ((diversity or plural$3) near2 (receiver$ or antenna$))	14
☐	L6	L4 and l3	13
☐	L5	L4 and l2	22
☐	L4	((combin$3 or sum$4) near (rf or (radio near frequenc$3))) and ((diversity or plural$3) near2 (receiver$ or antenna$))	266
☐	L3	375/147.ccls. or 375/130.ccls. or 375/148.ccls. or 375/144.ccls. or 370/335.ccls. or 370/441.ccls.	2781
☐	L2	(375/267.ccls. 375/316.ccls. or 375/347.ccls. or 455/132.ccls. 455/137.ccls. or 455/138.ccls. or 455/138.ccls.)	2528
☐	L1	((combin$3 or sum$4) near (rf or (radio near frequenc$3))) same ((diversity or plural$3) near2 (receiver$ or antenna$))	45

END OF SEARCH HISTORY